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Jacksonville, Florida  
May 3, 2019  
DCA19MA143

**NATIONAL TRANSPORTATION SAFETY BOARD  
WASHINGTON, D.C.**




ATTACHMENT 7

MIAMI AIR LIFE RAFT DEPLOYMENT FAILURE INVESTIGATION REPORT

Pages 26



**ENGINEERING DOCUMENT NUMBER 4890****INVESTIGATION REPORT  
Miami Air Life Raft Deployment Failure****Life Raft Part Number D23940-117  
Serial number 5625A****Revision A**

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**Revision Control Sheet**

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**Appendix I:**   NTSB Survival Factors Group Field Notes, dated 9 July 2019  
                  Life Raft Inspection, NTSB # DCA19FA143

## **1.0 SCOPE**

This document is a summary of the investigation of an Air Cruisers 46 person life raft that failed to inflate when deployed during an emergency evacuation following a runway overrun on 3 May 2019 at the Jacksonville Naval Air Station. The aircraft, a Miami Air International 737-800, came to a rest in the St. Johns River just beyond the runway. The flight crew deployed the life raft from the forward right hand door, but the life raft failed to inflate.

The official Field Notes from the National Transportation Safety Board (NTSB) Survival Factors Group that inspected the subject life raft are contained in Appendix I. This report provides additional details in support of those findings.

## **2.0 APPLICABLE INFORMATION/DOCUMENTS**

### **2.1 Life Raft Identification**

46 person Life Raft part number D23940-117,  
Life Raft Sub Assembly Part Number 62738-103,  
Serial number 5625A, Date of manufacture April 2003

Life raft installed on Miami Air International 737-800 aircraft,  
Registration N732MA

### **2.2 Safran Aerosystems Documentation and References**

Air Cruisers Component Maintenance Manual (CMM) 25-60-10

Air Cruisers Folding Procedure P-11800

Incident logged as IN-0348 in the Incident Database

### **2.3 NTSB Documentation – Reference NTSB # DCA19FA143**

NTSB Survival Factors Group Field Notes dated 9 May 2019,

NTSB Survival Factors Group Field Notes dated 9 July 2019  
(included as Appendix I).

Photos included herein are sourced from the NTSB Field Notes and other records associated with this NTSB investigation

## **3.0 BACKGROUND & EVALUATION**

### **3.1 Incident Description**

On 3 May 2019, Miami Air International flight 293 overran the runway after a rainy, late night landing at the Jacksonville Naval Air Station. The aircraft came to rest in the St. Johns River just beyond the runway. The evacuation of the aircraft was conducted with the intent of using the four life rafts on board to move passengers from the aircraft to the Naval Air Station property. Three of these life rafts deployed as expected, and these were used to ferry passengers from the aircraft to a nearby pier and to the rock wall at the shoreline. The fourth life raft failed to inflate and sank into the river following the attempt to deploy it from the right hand forward door.

Figure 1, an overview of the aircraft the day after the event, shows all four life rafts. The life raft that failed to inflate is visible underwater at the front of the aircraft, on the left side, where it had drifted due to the river current. This life raft, labeled Raft #1 in the photo, is a 46 person Air Cruisers life raft with part number D23940-117 and serial number 5625A. This life raft is the subject of the investigation by the NTSB Survival Factors Group, and the subject of this report.





Figure 1  
Life Rafts after the Event

The photos in Figures 2 and 3 show the life raft and its carrying case in the water near the right hand forward door after the event.

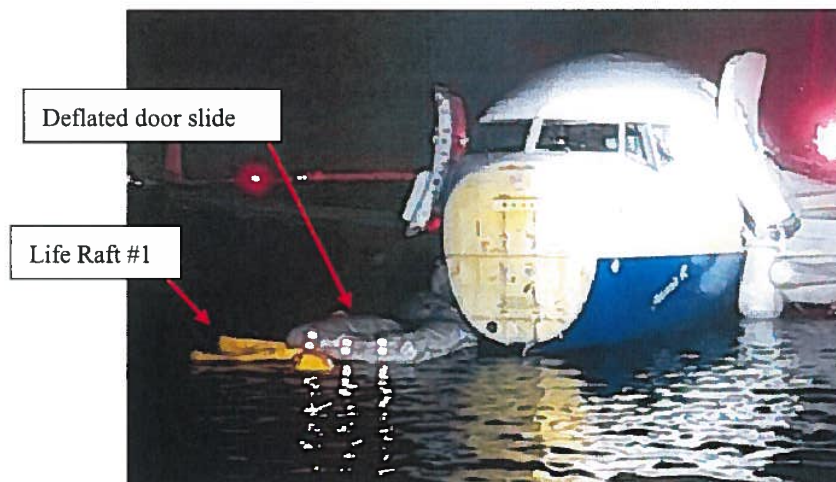


Figure 2  
Life Raft #1 in the Water



Figure 3  
Life Raft #1 and Deflated Evacuation Slide at RH Forward Door

Based on the official witness statements, a flight attendant opened the right hand forward door during the emergency evacuation. The evacuation slide on this door inflated, but then immediately deflated. The flight crew then deployed the subject life raft through this door over the deflated evacuation slide, but the life raft failed to inflate.

The mooring line for Life Raft #1 was secured to the aircraft, which is the initial step in the deployment process. The NTSB Survival Factors inspection team found the end section of this mooring line wrapped around several latches for the galley carts in the galley adjacent to the RH forward door. The snap hook at the end of the mooring line was attached to the seat belt buckle at seat 1C in the first row of seats behind the

galley (see photos in Figure 4). This section of the mooring line had either separated from the life raft or had been cut off following the event.

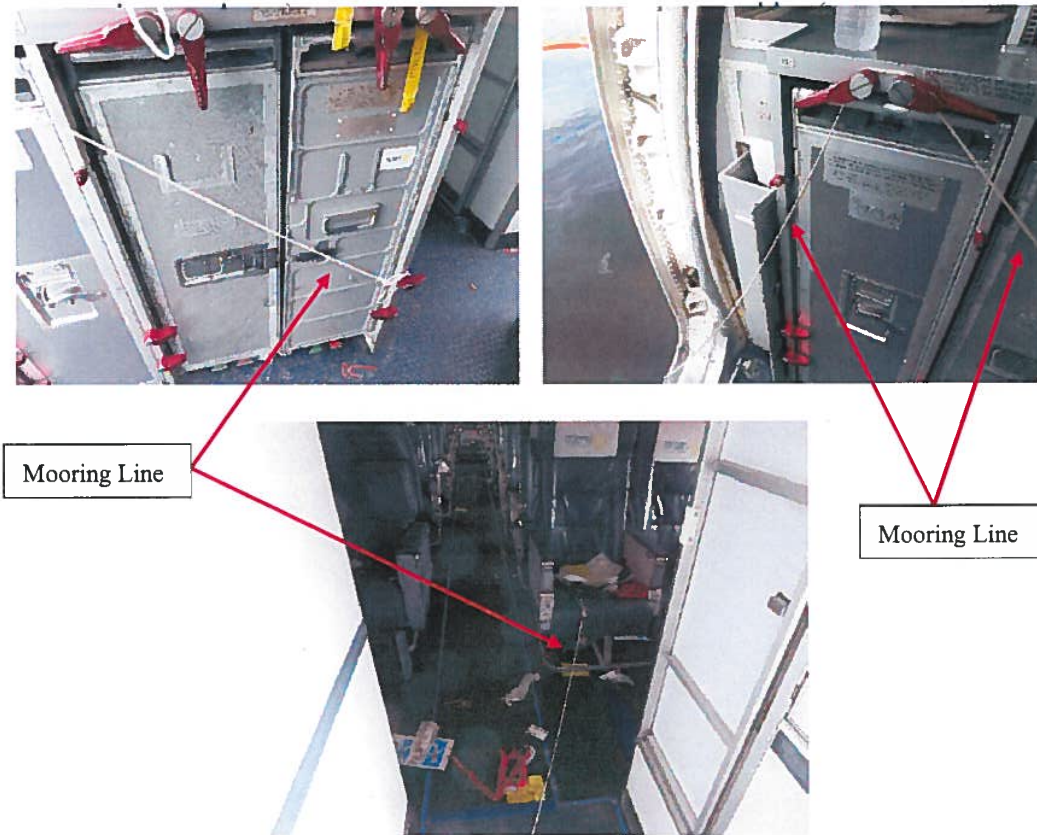


Figure 4  
Life Raft Mooring Line Secured to Aircraft

The action to secure the mooring line to the aircraft ensures that the inflated life raft will remain with the aircraft after inflation. Using a pull handle attached to this mooring line, the flight crew can then open the carrying case of the life raft and initiate inflation of the life raft once the life raft has been deployed from the aircraft. Both the carrying case release cable and the valve release cables (which open the





inflation valve on the reservoir and valve assemblies) are attached to the mooring line.

The NTSB field response team retrieved the life raft and carrying case from the river. The carrying case, shown in Figure 5, was unremarkable with no unusual damage or other findings of potential interest.



Figure 5  
Life Raft #1 Carrying Case

The life raft was shipped to the Belmar facility of Safran Aerosystems Evacuation, manufacturer of the life raft under the Air Cruisers brand name, for a more detailed inspection. The carrying case was not included as it had opened and released the packed life raft as expected during the deployment.

### 3.2 System Inspection

The NTSB Survival Factors Group performed a detailed inspection of the life raft on 9 July 2019 at the Safran Aerosystems Evacuation facility in Belmar, NJ.

Several tears were found in one of the airholding tube assemblies. A 14 ½ inch jagged tear, with adjacent fabric chafing damage, was found at the “KNIFE” stencil,

as shown in Figure 6 below. A second tear, 6 inches in length, was found on the opposite side of the life raft tube assembly, near a locator light as shown in Figure 7.



Figure 6  
14 ½ inch Tear in Airholding Tube



Figure 7  
6 inch Tear in Airholding Tube

The other airholding tube assembly was not inspected as the root cause of the inflation failure was believed to have been determined. An attempt to inflate the life raft was not performed due to the identified cuts and tears in the airholding tube.



Distinct fold lines were still evident in the life raft tube fabric at various locations, indicating that these areas had not inflated during the attempt to deploy the life raft. An example is shown in Figure 8.



Figure 8  
Fold Lines Still Evident

The mooring line was severed but was still attached to the life raft. The severed end of the mooring line is shown in Figure 9, with the valve opening actuation cable and carrying case release cable still attached. There were several locations on the mooring line with chafing damage.



Figure 9  
Severed Mooring Line

There are two independent inflation gas reservoir and valve assemblies on this life raft (one for each tube assembly on the life raft). Both inflation valves were found in the fully open position with the inflation cables extracted, which is the expected condition following a life raft deployment (see Figures 10 and 11). Both pressure gages indicated that the gas reservoirs were empty.

Valve Position Indicator: Full Open Position

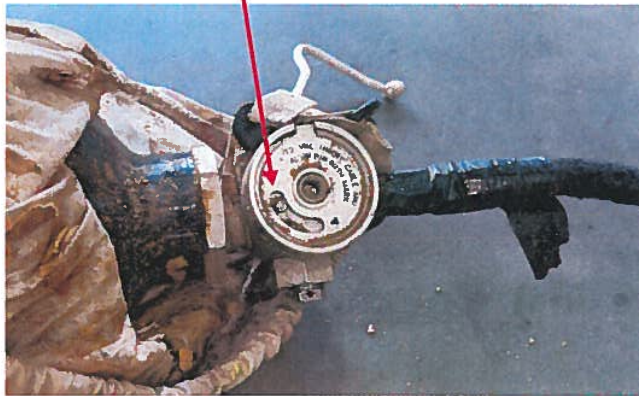


Figure 10  
Fully Open Inflation Valve #1

Valve Position Indicator: Full Open Position

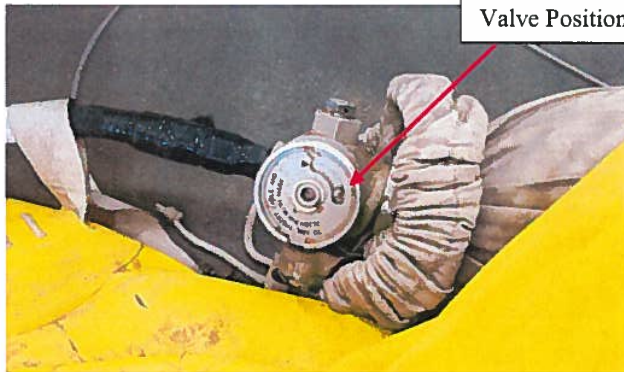


Figure 11  
Fully Open Inflation Valve #2



Two inflation hoses connect the outlet port of each reservoir and valve assembly to a jet pump. These inflation hoses were routed along the outside of the life raft in accordance with the assembly procedures in the applicable CMM. However, these inflation hoses were not connected to the jet pumps that supply the high-pressure inflation gas and ambient air to the air holding tube structures as shown in Figure 12.

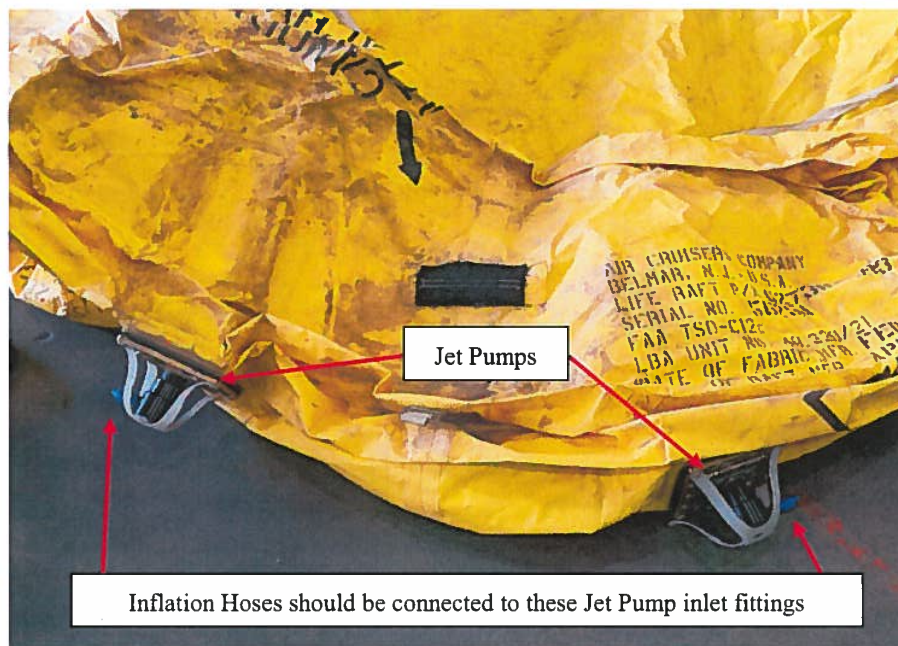


Figure 12  
Inflation Hoses Not Connected to Jet Pumps

A safety cap was installed on the inflation gas inlet port on each jet pump as shown in Figures 13 and 14. This is the location where the inflation hoses should have been connected. Consequently, none of the inflation gas stored in the reservoirs would have reached the life raft assembly when the life raft was deployed.



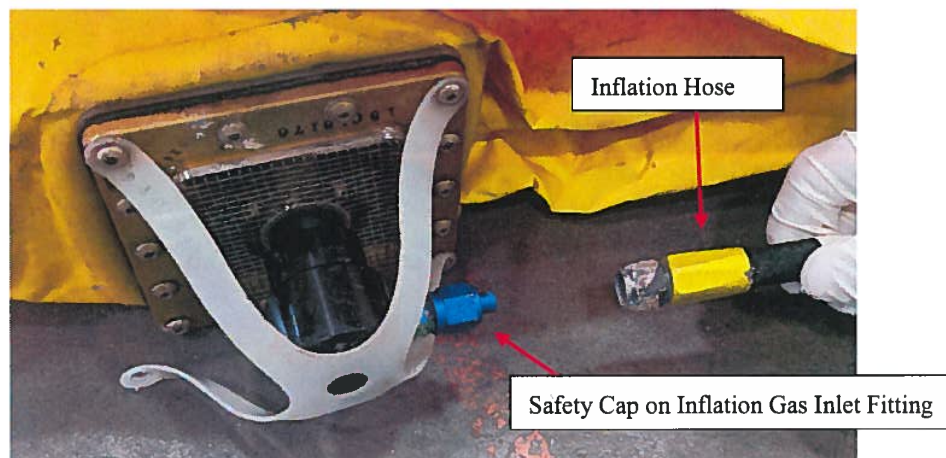


Figure 13  
Jet Pump #1 Inflation Gas Inlet Fitting Capped

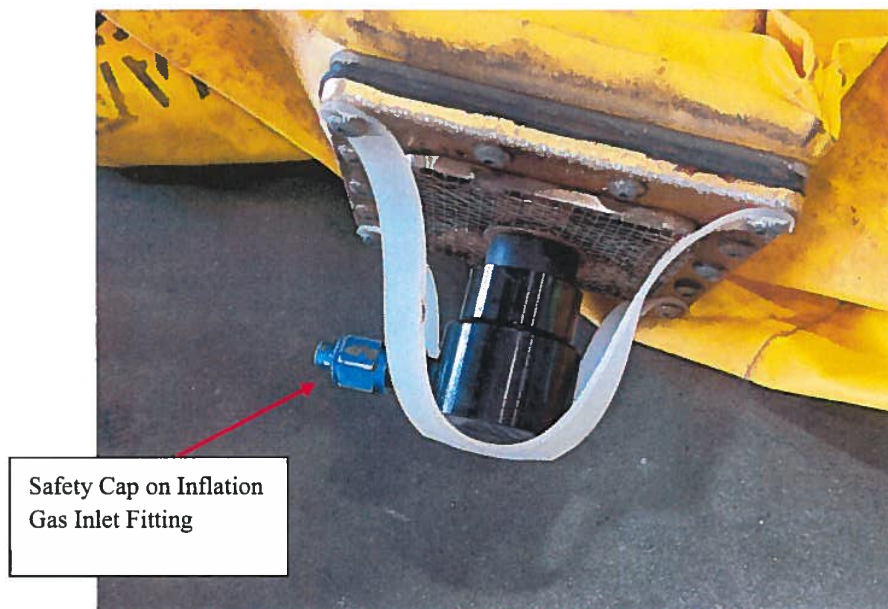


Figure 14  
Jet Pump #2 Inflation Gas Inlet Fitting Capped



### **3.3 Maintenance History**

The life raft was installed on the subject aircraft on 4 February 2019, after transfer from Miami Air aircraft N733MA. The life raft had been installed on N733MA on 11 August 2018 following standard maintenance on the life raft.

The last maintenance on the life raft was performed by American Southeast Inflatable & Oxygen, FAA Repair Station YISR800L, of Miami Florida, and certified for service on 27 June 2018 in accordance with CMM 25-60-10 revision 21. This was the current revision of the CMM at that time. The folding procedure for this life raft is P-11800, which is currently Revision L, issued in October 2016.

CMM 25-60-10 was updated to Revision 22 in October of 2018. A review of the changes incorporated into Revision 22 did not find any changes that would have been significant to this incident.

### **3.4 Similar Incidents**

There are no similar incidents involving disconnected inflation hoses in the Incident databases that are maintained to track significant field issues.

## **4.0 ANALYSIS & DISCUSSION**

### **4.1 Deployment Analysis**

The D23940 life raft consists of two independent, airholding tube assemblies with the raft floor mounted between the tube structures. This allows the raft to be loaded immediately after inflation, using the side that is facing upward.

Each airholding tube assembly has its own independent inflation gas reservoir and valve assembly that supplies pressurized gas to a jet pump that inflates the tube



assembly. When these gas reservoirs are charged, the inflation valve is closed with one end of the valve release cable inserted into a pulley inside the valve. Each valve release cable is then routed through a ring at the end of a short actuation cable that is connected to the mooring line. The ends of the valve release cables are then connected to a fixed D-ring on the opposite reservoir and valve assembly.

When the life raft is deployed, the pull handle on the mooring line is used to release the carrying case and initiate inflation. Inflation is initiated by the tension on the mooring line and the valve release actuation cable, which pulls the valve release cables out of the inflation valves, opening the valves to release inflation gas from the reservoirs. The inflation gases are then routed through the inflation hoses to the jet pumps, which direct the high-pressure inflation gas and entrained ambient air into the tube assembly for inflation.

In this case, both inflation valves opened as expected, and all of the inflation gas was discharged from the reservoirs. However, since the inflation hoses were not connected to the jet pumps, all the inflation gas escaped and the life raft was not able to inflate.

CMM Assembly section paragraph 18 outlines the procedure for installing the inflation hoses to the jet pumps. Steps 11H and 11I of Folding Procedure P-11800 reference a leak check of all inflation hose connections, and the taping of the hose fitting at the jet pumps, respectively.

The installation of a safety cap on the jet pump inflation gas inlet would allow the life raft to be leak tested or repaired after removal of the inflation hoses and reservoir and valve assemblies for inspection and testing of these components per the CMM. The tear down/inspection report from American Southeast from the last maintenance on the life raft noted that the reservoir had been hydrotested, and the inflation hose had



been pressure tested, which requires the removal of these items from the life raft. This may be the explanation for the installation of a safety cap on the jet pump gas inlets.

The tears in the life raft tube assemblies are believed to be a consequence of the retrieval effort, since the sunken life raft had drifted under the aircraft in an area with known damage to the aircraft understructure and front gear.

#### **4.2 Risk Assessment**

A review of the maintenance procedures at the facility which performed the prior maintenance event is necessary to provide a proper risk assessment.

#### **4.3 Risk Mitigation**

Proper focus on the assembly procedures is necessary to minimize the risks associated with human factors. The instructions in the CMM and folding procedure are sufficiently detailed to ensure proper installation.

### **5.0 CONCLUSION**

The subject life raft subject failed to inflate due to a failure to connect the inflation hoses to the jet pumps that supply inflation gas and ambient air to the life raft. The life raft deployed as expected, but could not inflate due to the escape of inflation gas through the disconnected inflation hoses.

Sufficiently detailed instructions for connection of the inflation hoses to the jet pumps are contained in the CMM and the folding procedure.

The subject life raft should be removed from service due to its lengthy exposure to water and damage associated with the incident.

**Appendix I:** NTSB Survival Factors Group Field Notes dated 9 July 2019  
Life Raft Inspection

